Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of Level 3 Communications L.L.C. Petition for Forbearance Under 47 U.S.C. § 160(c) From Enforcement of 47 U.S.C. § 251(g), Rule 51.701(b)(1), and Rule 69.5(b)	WC Docket No. 03-266

Analysis of the QSI Study

I. Introduction and Background

1. My name is William E. Taylor. I am Senior Vice President of National Economic Research Associates, Inc., head of its Communications Practice, and head of its Cambridge office located at 200 Clarendon Street, Boston, Massachusetts 02116.

2. I have been an economist for over thirty years. I earned a Bachelor of Arts degree from Harvard College in 1968, a Master of Arts degree in Statistics from the University of California at Berkeley in 1970, and a Ph.D. from Berkeley in 1974, specializing in Industrial Organization and Econometrics. For the past twenty-five years, I have taught and published research in the areas of microeconomics, theoretical and applied econometrics and telecommunications policy at academic and research institutions including the Economics Departments of Cornell University, the Catholic University of Louvain in Belgium, and the Massachusetts Institute of Technology. I also conducted research at Bell Laboratories and Bell Communications Research, Inc. I have appeared before state and federal legislatures, testified in state and federal courts, and participated in telecommunications regulatory proceedings before state public utility commissions, as well as the Federal Communications Commission, the Canadian Radio-television Telecommunications Commission, the Mexican Federal Telecommunications Commission and the New Zealand Commerce Commission.

3. My name is Timothy Tardiff. I am Vice President of National Economic Research Associates, Inc., and my business address is 200 Clarendon Street, Boston, Massachusetts 02116.

4. I have specialized in telecommunications policy issues for over 20 years. I received a B.S. degree from California Institute of Technology (with honors) in 1971 and a Ph.D. in Social Science from the University of California, Irvine in 1974. My research has included studies of the demand for telephone services, such as local measured service and toll; analysis of the market potential for new telecommunications products and services; assessment of the growing competition for telecommunications services; and evaluation of regulatory frameworks consistent with the growing competitive trends. Since the passage of the Telecommunications Act, I have participated in interconnection arbitrations, unbundled element proceedings, universal service investigations, applications by incumbent local exchange carriers for authorization to provide interLATA long-distance, and implementation of the Triennial Review Order rules for unbundling network elements, in over 20 states. I have also participated in regulatory proceedings before the Federal Communication Commission, as well as a price cap proceeding in Peru, and interconnection and universal service proceedings pursuant to New Zealand's 2001 Telecommunication Act.

II. Summary

5. Level 3 Communications ("Level 3") has indicated that on January 27, 2005 it submitted into the record in this docket a study by QSI Consulting Inc. ("QSI")[1] purporting to measure the difference between the revenues large incumbent local exchange carriers (ILEC) would receive on non-local traffic between Voice over Internet Protocol ("VoIP") subscribers and the Public Switched Telephone Network ("PSTN") pursuant to reciprocal compensation charges instead of interstate switched access charges. We have been asked by the United States Telecom Association ("USTA") to examine the QSI Study to determine if its methodology is appropriate, its calculations are correct and its assumptions are reasonable.[2]

[1] "IP-Enabled Voice Services: Impact of Applying Switched Access Charges to IP-PSTN Voice Services," prepared by QSI Consulting, Inc. on behalf of Level 3 Communications L.L.C., ("QSI Study").

[2] We have limited our analysis to the large ILECs included in the QSI Study and have not examined the impact on other ILECs, particularly rural ILECs, because our purpose is not to develop our own estimate of the harm from the Level 3 forbearance petition but, rather, simply to analyze the QSI Study. We note that USTA has strongly opposed the Level 3 Forbearance Petition in part because it believes that the so-called "rural exemption" in the Level 3

6. Our examination has revealed substantial flaws in the methodology and assumptions in the QSI study. Fixing those flaws, we find that QSI severely underestimates the impact shown by its own model. When the model is corrected, the impact amounts to more than two billion dollars less revenue for non-rural ILECs in 2008.[3] It also fails to take account of a number of important factors such as arbitrage, fraud, and the impact on rural ILEC access revenues and universal service. As such, it would be unreasonable for the Commission to rely on QSI's conclusions.

A. Errors in Basic Methodology

7. We find that the basic methodology of the QSI Study contains four critical errors. First, the QSI Model assumes that if Level 3's petition is not granted, the application of access charges to VoIP traffic would be exclusively at interstate rate levels. This follows from QSI's assumption that carriers today pay reciprocal compensation charges to terminate VoIP calls, and the application of access charges would be a change ordered by the FCC. In fact, however, many carriers today pay interstate and intrastate access charges on VoIP traffic they terminate on the PSTN. The correct measure of ILEC access revenue under an access charge regime for comparison to a reciprocal compensation regime, therefore, is intrastate access charges on intrastate minutes and interstate access charges on interstate minutes.

8. Second, the QSI Study assumes that differences in the pricing regime for providing access to the PSTN for VoIP calls can lead to differences in end user long distance prices and to differences in the demand for VoIP services. This stimulation assumption suffers from a number of flaws.

- The QSI Study assumes that carriers today pay reciprocal compensation charges to terminate VoIP calls and that industry forecasts of future VoIP demand are contingent on that assumption. In fact, however, many carriers today pay interstate and intrastate access charges on VoIP traffic they terminate on the PSTN.
- The QSI Study assumes that under a reciprocal compensation charge regime, costs for VoIP providers would be lower (than under an access charge regime) and that VoIP providers

---

Forbearance Petition will not be effective and that the impact on rural ILECs will be comparable to, and potentially more severe than the impact on the large ILECs included in the QSI Study.

[3] This estimate represents our analysis of the QSI study within the structure and context of the QSI Model itself. All we have done is make corrections and examine sensitivities within that structure. As such, this estimate does not represent our own independent analysis of the true cost of granting the Level 3 Petition, which would include categories of cost not considered here.

would pass through their lower costs to end users in the form of lower retail prices.[4] The assumed lower retail prices would then stimulate demand for VoIP. However, there is no evidence that these providers would offer end users any reduction in the prices for VoIP service. The high margins that many VoIP suppliers currently experience[5] and the fact that VoIP prices are currently substantially below the comparable plans that circuit switched providers offer[6] imply that these markets are not currently in equilibrium so that a reduction in marginal cost need not result in a reduction in price.

- Moreover, as shown below, the QSI Study estimates that the difference in per-line interconnection charges between reciprocal compensation and access charges is approximately $2 per line per month. Even if that difference were passed through in lower prices to end users, the effect would be too small relative to the retail price to account for the demand stimulation assumed by the QSI Model.

9. Third, the QSI Model incorrectly removes from the calculation VoIP lines that migrate from special access, competitive local exchange carriers (CLECs) or wireless carriers and their associated usage. Contrary to QSI's assumptions, these lines cannot be ignored in the analysis because they originate traffic that pays either switched access or reciprocal compensation on the terminating end, which is the very thing the QSI Study purports to measure.

10. Fourth, the QSI Model calculations assume that the ILEC receives originating and terminating access charges on the broadband end of VoIP traffic carried over the ILEC's DSL service. However, access charges are usually thought to apply only to the use of the PSTN and thus would not apply on the broadband connection for VoIP-PSTN traffic. In any event, the ILEC has no way of knowing that certain traffic between the end user and the Internet Service Provider (ISP) represents voice traffic, let alone voice traffic that would be classified as long distance.

[4] The QSI Study also fails to recognize that many carriers, like Level 3, that are subject to the intercarrier compensation rules do not provide VoIP service directly to retail customers, but rather provide wholesale service to VoIP providers. The study thus assumes that such carriers would pass through lower costs to their wholesale customers who would, in turn, pass them through to their retail customers. There is no evidence that either pass-through would occur.

[5] Operating margins in excess of 40 percent are frequently cited. See, for example, Ted Hearn, "Cable Companies Accustomed to Large Capital Outlays Are In For A Pleasant Surprise," Multichannel News, February 16, 2004, at http://www.vonage-forum.com/printout710.html (accessed 2/27/05).

[6] For example, Vonage [http://www.vonage.com] offers unlimited local and long distance calling for only $24.99 per month. VoicePulse - [http://www.voicepulse.com/] offers unlimited residential calling throughout the U.S. for $34.99 per month or $24.99 per month with a 12 month commitment. Its business service is priced at $45.99. Packet8 [www.packet8.net] offers unlimited service for $19.95 per month. Comparable wireline packages are priced between $45 and $50 per month.

11. Correcting these errors has the effect of increasing the QSI Model's estimate of the net ILEC revenue reduction from adoption of a reciprocal compensation regime for VoIP traffic that uses the PSTN from approximately $214 million to approximately $980 million in 2008. In addition, these results are quite sensitive to other assumptions in the model, including:

- the proportion of local calls terminating on VoIP lines that are treated as long distance,
- errors in the forecast of VoIP lines in 2008,
- changes in the levels of interstate and intrastate access charges,
- uncertainty in the average usage for VoIP customers.

Our adjusted Base Case version of the QSI Model yields estimates of net effects on ILEC revenue that range from $719 million to $1.242 billion in 2008 for reasonable ranges of these parameters of the model.

12. Additionally, the QSI Study overlooks several significant implications of granting Level 3's petition that cannot be ignored for public policy purposes:

- the effect of arbitrage and the likelihood of fraud under a reciprocal compensation regime, in which identification of VoIP traffic rests entirely with the carrier delivering traffic to the ILEC for termination. Creation of a reciprocal compensation regime for VoIP traffic would create an incentive for carriers to misclassify circuit-switched traffic as VoIP traffic. Recent experience associated with similar incentives in the industry demonstrates the reality of this risk.
- the effect of the adoption of reciprocal compensation on rural ILECs, for which a large portion of long distance traffic is terminated indirectly through *non-rural* ILECs. Carrier access charges comprise a large fraction of total revenue for many rural ILECs, and the QSI Model ignores the effect of the Level 3 Petition on the access charges that rural ILECs could actually measure and collect under a reciprocal compensation rule for non-rural ILECs.
- the effect on Universal Service of removing substantial access charge revenue, and
- the effect on competition in telecommunications markets from giving an artificial regulatory advantage to VoIP providers over providers of other services such as circuit-switched or wireless long distance calls that use the PSTN in the same way.

B. Other Errors

13. In addition to the four errors discussed above, the QSI Model makes a number of other errors and faulty assumptions. These errors have a substantial impact on the results QSI claims. For example, QSI fails to account correctly for the demand stimulation or suppression that it incorrectly assumes. In the QSI Study, the role of the stimulation it assumes is to increase — in

two ways — the ILECs' revenue under the reciprocal compensation regime and thus to reduce the measured impact of the Level 3 Petition. First, though the ILECs receive a smaller per-minute compensation under reciprocal compensation for VoIP traffic terminating on the PSTN, the volume of such traffic is assumed to increase under reciprocal compensation. Second, the assumed increase in VoIP lines is assumed to generate an increase in ILEC DSL lines, and the QSI Model includes the additional retail revenue from those lines as an offset against the ILEC's lower switched access revenue under reciprocal compensation.

14. The error in this calculation stems from QSI's ignoring the possibility of substitution between VoIP lines and ordinary switched access lines. That is, if the model is going to assume that customers buy more VoIP lines under a reciprocal compensation regime, it should also recognize that customers ought to buy correspondingly fewer ILEC switched access lines.[7] The effect of this error is to overstate the net reduction in ILEC switched access revenue under reciprocal compensation, by ignoring the loss in switched access revenue from the exchange access lines lost to VoIP substitution.[8]

15. In addition, the QSI Model assumes that the demand for additional VoIP lines it claims would be associated with a reciprocal compensation regime would increase demand for ILEC DSL lines, leading to additional retail DSL revenue. In our view, considering the possible effects of intercarrier compensation on retail revenue from competitive services such as DSL is inappropriate: such revenue depends on the successes or failures of these services in the marketplace, and regulatory attempts to fix possible problems with intercarrier compensation should not be based on speculations about or preferences for such successes or failures. Nonetheless, if the QSI Model insists on offsetting ILEC switched access revenue reductions with (assumed) additional retail DSL revenue under reciprocal compensation, it ought to calculate the effect on retail revenues correctly. In particular, the additional ILEC switched access lines under an access charge regime would generate subscriber line charges ("SLCs"), as well as retail revenue from basic exchange service, vertical services and local and long distance usage.

[7] Or, symmetrically, if there are fewer VoIP access lines under an access charge regime, there will be correspondingly more ILEC switched access lines.

16. To correct this error, we must accept, strictly for the purpose of the calculation, QSI's assumption that there would be 25 percent more VoIP lines under reciprocal compensation than under access charges. Assuming VoIP and local exchange lines are substitutes, we find that correcting QSI's treatment of stimulation yields a difference in net loss of approximately $1,195 million in ILEC switched access revenue in 2008.[9] The loss of SLC revenue from the reduced number of switched access lines under reciprocal compensation amounts to an additional $180 million. Lost additional retail revenue from those lines is approximately $748 million. Finally, we correct QSI's calculation of the assumed increase in ILEC DSL revenue from VoIP stimulation under reciprocal compensation, obtaining an offset of approximately $59 million in 2008.

17. Under these assumptions, the total difference in non-rural ILEC revenue between an access charge and reciprocal compensation regime is approximately $2,063 million in 2008.

C. Conclusions

18. Clearly, the QSI Study is fundamentally flawed and should not be the basis for any conclusions by the Commission. Whatever policy implications one might draw from QSI's assertion that adopting a reciprocal compensation regime for the termination of VoIP calls on the PSTN would reduce non-rural ILEC revenue by $214 million are likely to be reversed when the corrected model yields an estimate ($980 million), which is higher by a factor of nearly five. Moreover, under the stimulation assumptions of the QSI Model, the effect on non-rural ILEC access and retail revenue is not the $214 million it calculates, but rather $2,063 million, or nearly ten times greater. In addition to these errors, it is clear that the model estimates depend critically on many uncertain assumptions, and reasonable variation in those assumptions leads to differences in the outcomes that are too large to be useful for policy decisions. Finally, the QSI Model omits a number of factors — including arbitrage, fraud, the impact on rural ILEC access revenues and universal service subsidies — whose effect on ILEC revenues would be important to know before assessing the effects of the Level 3 Petition.

---

[8] Or, symmetrically, the assumption understates ILEC switched access revenue under access charges because it ignores the additional switched access revenue from the additional switched access lines substituted from VoIP lines.

III. The QSI VoIP Impact Model

19. The QSI VoIP Impact Model is a large, complex spreadsheet that attempts to compare non-rural ILECs' access revenue for VoIP traffic that uses the PSTN under two regimes: one based on reciprocal compensation payments and one based on interstate switched access charges. The model uses forecasts of VoIP access lines through 2008 and QSI's assumptions about usage per line and the number of originating and terminating minutes that would pay interconnection charges under an interstate access charge or a reciprocal compensation regime. The QSI Study assumes that VoIP providers today are paying reciprocal compensation, but in reality, many VoIP providers are paying interstate and intrastate access charges for terminating VoIP traffic on the PSTN.

20. Measuring the revenue impact of substituting reciprocal compensation for access charges would be straightforward if the number of VoIP access lines (and amount of VoIP traffic) were the same under the two regimes. QSI incorrectly assumes they are not. Since the price to terminate a minute under access charges is higher than under reciprocal compensation, the model assumes lower end user prices and faster growth of VoIP service under a reciprocal compensation regime. Much of the detail of the model and its assumptions are used to forecast the difference in VoIP volumes under the two regimes.[10]

A. Overview of QSI Calculation

21. The QSI Model calculates the difference in ILEC revenue under an interstate access charge and a reciprocal compensation regime in three steps. First, forecasts of usage per line and the number of lines for VoIP customers are calculated for the 2005-2008 period under reciprocal compensation and, using an assumed suppression factor, under interstate access charges. Stimulation factors are applied to account for the expectation that VoIP customers' usage would exceed that of average ILEC customers and QSI's assumption that the lower price for reciprocal compensation would result in lower end user prices and greater demand for VoIP lines and usage.

---

[9] This calculation assumes the last three errors in the previous section have been corrected: *i.e.*, (i) the treatment of VoIP lines that migrate from special access, CLEC or wireless facilities, (ii) the use of the blended carrier access charge instead of the interstate rate, and (iii) the double-counting of access charges on ILEC DSL lines.

22. Second, the difference in usage-based access charge revenue is calculated separately for VoIP service over cable and over DSL. For cable-based and DSL-based VoIP services separately, the model

- estimates the number of VoIP lines, excluding those migrating from special access, wireless and CLEC facilities,
- based on that number of lines, estimates total originating and terminating VoIP minutes by factoring up average LEC minutes per line to account for the greater originating and terminating volumes assumed for VoIP customers and the lower price of VoIP calls at the originating end of the call.
- assumes that 16 percent of the minutes that terminate on these VoIP lines are "local" calls that are actually made to customers outside the local calling area.[11] The QSI Model assumes that, under an access charge regime, the ILEC *receives* originating interstate access charges on these minutes, while under reciprocal compensation, the ILEC *pays* a terminating reciprocal compensation charge to the CLEC or ISP,[12] and
- assumes that for traffic that originates on the VoIP line and terminates on the PSTN, the ILEC receives the reciprocal compensation rate under the reciprocal compensation regime and interstate access charges under the access charge regime. For ILEC DSL VoIP lines, the QSI Model assumes that the ILEC receives both originating and terminating access charges for VoIP traffic under the access regime.

23. Third, the QSI Model offsets the lower ILEC access revenue under the reciprocal compensation regime by assuming that that regime would stimulate demand for ILEC DSL lines, on which the ILEC would receive $30 per month in revenue. In particular, 15 percent of the difference between the assumed numbers of DSL lines under the two regimes is treated as a source of additional ILEC revenue attributable to the reciprocal compensation regime. That stimulation of VoIP lines, however, is apparently assumed, inconsistently, to have no effect on the number of ILEC ordinary switched access lines, because the DSL revenue increase is not reduced to account for the loss of ordinary access line revenue.

24. We have summarized these results of the QSI calculation in Table 1, showing a difference in ILEC access revenue between the regimes in 2008 of

---

[10] As explained above, this assumption is fundamentally flawed. There is no evidence that these markets are in equilibrium, and VoIP providers would not necessarily pass through reductions of approximately $2 per line per month in the charges paid to ILECs for terminating calls to end users in the form of lower prices.

[11] For example, a call from a Boston-area ordinary access line to a VoIP customer with a 617 area code who takes the call in San Francisco.

[12] These are assumptions of the QSI Model, which we will maintain in order to generate an apples-to-apples comparison. The actual treatment of such traffic today varies widely across carriers.

- $118,176.890 for cable-based VoIP and $193,600,876 for DSL-based VoIP, which sums to $311,777,766 or 6.64 percent of ILEC switched access revenue,
- Offset by $98,181,572 in incremental DSL revenue, amounting to $213,596,195 or 4.20 percent of ILEC access plus incremental DSL revenue.

These figures agree with the results for 2008 set out in the QSI Report.[13]

B. QSI's Interpretation of the Results

25. The QSI Study interprets its calculations as evidence that the difference in ILEC access and DSL revenue between applying interstate switched access charges or reciprocal compensation to non-local VoIP traffic that terminates on the PSTN is small. In particular, it assumes that ILECs would receive approximately $214 million more in usage-based access and DSL revenue under an access charge regime than under reciprocal compensation or 4.2 percent of total ILEC switched access and incremental DSL revenue. The QSI Study observes that these revenue changes would be smaller than those associated with (i) its estimate of the substitution of wireless for ILEC toll service over the next four years or (ii) the historical reduction in switched access charges over the 1997 – 2008 period.

IV. Corrections to the QSI Model

26. In Attachment 1, we simplified the format of the calculation in the QSI Model. No corrections or changes in assumptions were made, and the resulting change in net ILEC revenue ($213,536,195) is the same as that reported by QSI. In Attachment 2, we followed the same format but corrected the following four errors in the calculation. The corrected QSI Model is then taken to be our Base Case Model for the purpose of testing the Model's sensitivity to other assumptions.

A. ILECs Collect Intrastate and Interstate Access Rates under an Access Charge Regime

27. The QSI Model applies an assumed interstate switched access rate of $0.006 to *all* long distance minutes of use, both intrastate and interstate.[14] A more accurate measure would apply a weighted-average of the ILECs' intrastate and interstate rates to this traffic. To implement the change, we simply applied QSI's blended intrastate-interstate access rate to all non-local

[13] See Table 3 on p. 6 of the QSI Study.

minutes. The effect of the change was to increase the net revenue effect by approximately $343 million in 2008.

B. ILECs Do Not Receive Access Charges from Calls Originating and Terminating on ILEC DSL Lines

28. Although not explained in the QSI Study, the QSI model assumes that under the access charge regime, the ILEC collects interstate switched access charges on the broadband end of VoIP calls initiated over an ILEC DSL facility as well as the PSTN end of the calls, effectively doubling the access revenue from such calls compared with the revenue from cable-based DSL VoIP calls.[15] In fact, there is no difference in a DSL-based or a cable-based VoIP service as far as the ability of the ILEC to assess access charges on the broadband end of the traffic. Even when the ILEC provides the DSL facility, it has no way of distinguishing VoIP traffic from any other type of Internet traffic, let alone determining whether the call was jurisdictionally local, intrastate or interstate. More fundamentally, as noted above, switched access charges are generally thought not to apply to the broadband end of VoIP to PSTN traffic.

29. To correct this calculation, we simply removed the factor of 2 associated with the calculation of originating and terminating revenues for DSL-based VoIP lines. The effect of this correction is to *decrease* the net revenue effect by approximately $206 million.

C. VoIP Lines Migrating from Special Access, CLECs and Wireless Carriers Cannot be Ignored Because They Generate Terminating Traffic

30. The QSI model assumes that customers migrating to VoIP from special access, CLEC or wireless facilities will not affect ILEC switched access revenues because, the QSI Study claims, those customers "do not pay switched access charges."[16] This assumption effectively reduces the number of lines and minutes on which the difference between revenues under an access charge and a reciprocal compensation regime is calculated by nearly 50 percent in the QSI model. However, even though the ILEC does not collect switched access charges from the *originating* end of calls on special access, wireless or CLEC facilities, ILECs did receive – and will continue

[14] In the QSI Model, changing the intrastate access rates to $0.006 in the "User Adjustable Input" tab in the Model has no effect on the $213,596,195 impact depicted on the High Level Impact tab.
[15] Compare the following cells in the QSI Model: (i) <$ Impact Calculation> columns Q-V, lines 12 and 16 and (ii) <$ Impact Calculation> columns Q-V, lines 20 and 24. These cells show that DSL-based VoIP lines generate twice the billable revenue/minute as cable-based VoIP lines.
[16] QSI Study at 28.

to receive – either access charges or reciprocal compensation when calls made by these customers terminate on the PSTN. Thus, under reciprocal compensation, for example, some previous CLEC customers may migrate to VoIP. Under access charges, while the ILEC received no originating access charges from their usage, it did receive terminating access charges, presumably at a weighted average of the interstate and intrastate rates. Under a reciprocal compensation regime, however, the ILEC would collect reciprocal compensation when the VoIP customer terminated calls on the PSTN. [17]

31. To correct this error, we calculated VoIP lines and usage without removing estimates of lines that migrated from special access, wireless or CLEC facilities. When traffic originating on special access, CLEC or wireless facilities terminates on the PSTN today, the ILEC collects terminating switched access charges. Once those customers migrate to VoIP, however, ILEC access revenue depends on the interconnection regime. Under access charges, calls originating on those VoIP lines that terminate on the PSTN would continue to pay terminating access charges. Under a reciprocal compensation regime, those calls would pay reciprocal compensation. The net revenue effect of this change in the Model is approximately $356 million.

D. Demand for VoIP Services Need Not Differ Between Reciprocal Compensation and Access Charge Regimes

32. The QSI Model assumes that in 2008, VoIP demand under an access charge regime would be 80 percent of the VoIP demand under reciprocal compensation. As discussed above, that assumption is fundamentally flawed. VoIP providers are entering rapidly growing markets using a different technology and are pricing their services significantly below those of the incumbent. In such disequilibrium markets, a small per-line difference in marginal costs would not be expected to be passed through dollar-for-dollar in lower end user prices. Moreover, that assumed difference in marginal cost is a very small percentage of the retail VoIP price, which would

[17] In fact, what these customers paid before migrating to VoIP is irrelevant. Since by assumption the bulk of the lines use VoIP under either an access charge or a reciprocal compensation regime, the difference in ILEC revenue is approximately the difference in what the respective interconnection charge regimes would yield for a VoIP line. But in any case, the QSI Model assumption that there would be no difference in the ILEC's revenue between reciprocal compensation and access charges is clearly incorrect.

remain well below the prices of comparable circuit-switched service bundles.[18] Thus, even if VoIP providers fully passed-through the effect of the difference in termination prices, a six percent difference in price would be hard-pressed to yield a 20 percent change in market demand.

33. To correct this assumption, we adjusted the parameters of the QSI Model so that the number of VoIP lines remained the same under access charges as under reciprocal compensation. We also eliminated the factor that caused average minutes per line to increase by different proportions under access charges and reciprocal compensation. The effect of this change is approximately $273 million in 2008.

34. Note that in this calculation, we did not correct other errors in the way in which the QSI Model treated assumed stimulated lines (*i.e.,* the additional VoIP lines assumed to stem from lower interconnection prices and lower end user prices in a reciprocal compensation regime) or the minutes and revenues associated with those lines. We address those errors in Section VI below.

V. Quantification of Changes

A. Correction of Errors

35. We began with the original QSI Model's estimate of the net ILEC revenue effect of a reciprocal compensation regime of approximately $214 million in 2008. First, we adjust for the fact that under an access charge regime, ILECs would collect a blended rate of interstate and intrastate access charges on non-local minutes. That change increases the net ILEC access revenue effect by $343 million. Next, we corrected for the fact that under access charges, ILECs do not receive switched access charges on the broadband end of VoIP calls that originate on ILEC DSL lines. This change *reduces* the net ILEC access revenue effect from a reciprocal compensation regime by $206 million in 2008. Accounting for the terminating traffic on VoIP

[18] The QSI Model assumes that under reciprocal compensation, VoIP lines would average 279 originating minutes per month and would receive 58 terminating minutes subject to the reciprocal compensation charge. At a rate of $0.0007 per minute, the originating minutes would generate $0.20, which would be offset by $0.04 paid by the originating ILEC for termination, for a net of $0.16 per line per month. Under an interstate access charge of $0.006 per minute, QSI assumes a VoIP line would originate an average of 267 minutes and terminate 58 minutes, which would generate revenue to ILECs of $1.95. Thus, according to QSI's assumptions, the difference between access charges and reciprocal compensation would be $1.95 - $0.16, or $1.79 per line per month. On a $30 per month VoIP retail price, the difference amounts to approximately 6 percent.

lines migrated from special access, wireless or CLEC facilities approximately doubles the volume of VoIP minutes on which the difference between access charges and reciprocal compensation is calculated. This increases the ILEC net revenue effect of charging reciprocal compensation rather than access by $356 million. Finally, removing the assumed stimulation of VoIP lines from the calculation increases the ILEC net revenue effect by $273 million in 2008.

36. Collecting these corrections to errors in the QSI Model, the net revenue difference between the regimes totals approximately $980 million for non-rural ILECs in 2008: an increase of $767 million over the $214 million difference calculated by QSI.[19] The revenue effects of these adjustments in 2008 are shown in Figure 1 below. The effect of these adjustments over the period of the QSI Study is shown in Figure 2.

B. Sensitivity to Assumptions in the Model

37. The results in the QSI Model depend on a large number of assumptions. Some of them are forecasts that are inherently unknowable (***e.g.***, the growth path of VoIP lines and minutes or the development of VoIP over stand-alone DSL service). Some can be estimated using current market data (***e.g.***, differences in the pattern of usage between VoIP and ILEC customers). For some assumptions, there appear to be no current data that would help (***e.g.***, proportion of locally-dialed calls that terminate non-locally on a VoIP line). In all of these cases, a careful analyst will include a sensitivity study, showing the degree to which the conclusions vary as the different assumptions are allowed to vary across a reasonable range. The tests we ran are outlined below, and the results are shown graphically in Figure 3. Note that each of the effects is measured individually; the effects from changing multiple assumptions at the same time would be different.

38. VoIP customer usage patterns. The QSI and Base Case models assume VoIP customers generate twice as much originating usage and 50 percent more terminating usage than do switched access customers. To judge sensitivity, we consider alternative scenarios in which these usage patterns are 50 percent higher or 50 percent lower than QSI's assumptions imply.

[19] As noted above in footnote 2, we do not address the likely harm to rural ILECs because QSI excluded this harm from its study based on (the likely flawed) assumption that Level 3's proposed rural carve-out will be effective.

39. Interstate and Interstate switched access charges. The level of interstate and intrastate access charges in the future is uncertain, as is the mix of interstate and intrastate traffic that VoIP providers will terminate on the PSTN. We consider a range of blended prices from 15 percent below to 15 percent above the rate assumed by the QSI Model.

40. Industry VoIP forecasts. The QSI Model calls for approximately 25 million VoIP lines by 2008, citing industry forecasts. There is obviously uncertainty associated with the number, and growth in these markets is far from linear and far from predictable. For example, there has been a rapid expansion of VoIP service by cable providers – approximately 5 million lines in 2004 and growing rapidly. As the industry observed with wireless growth, there is a fair probability that the industry paradigm will shift quickly to a VoIP base, so that the share of VoIP lines would increase rapidly in the center portion of an S-shaped logit curve. To measure sensitivity, note that a doubling (or halving) of the forecasted number of VoIP lines has the approximate effect of doubling (or halving) the revenue difference between the regimes. We considered variation of 15 percent above and below the forecast used by the QSI Model.

41. Proportion of locally-dialed calls to VoIP lines that are terminated as non-local calls. Determining the geographic endpoints of locally-dialed calls that terminate on a VoIP line is obviously uncertain. The QSI model assumes that 20 percent of such calls are terminated as long distance calls and that ILECs (i) receive originating access charges under an access charge regime and (ii) pay terminating reciprocal compensation under a reciprocal compensation regime. We vary that fraction from 10 percent to 30 percent.

42. These sensitivities of the Base Case model to variations in assumptions are shown in Figure 3. Reasonable variations in these assumptions lead to net impacts that vary from the Base Case by over $260 million annually in 2008 or by more than 25 percent of the base.

VI. Other Errors

43. As discussed above, the QSI Model relies on a set of flawed assumptions that a $1 to $2 difference between an access charge regime and a reciprocal compensation regime in the price of terminating VoIP calls would cause VoIP providers to price their services differently, which in turn would cause end users to buy more or less VoIP. For example, under a reciprocal compensation regime, QSI assumes that VoIP prices will be lower and further assumes that VoIP lines and usage will be higher. However, while the QSI Model assumes that fewer customers

will purchase VoIP under an access charge regime, it does not correspondingly assume that any of those customers whose demand for VoIP is assumed to be suppressed would purchase a switched access line. Stated conversely, the model assumes that all customers whose purchase of VoIP is assumed to be stimulated by lower prices would retain and continue to use a switched line.[20] We adjusted the QSI Model to account for the fact that some proportion of VoIP lines assumed to be stimulated or suppressed by the adoption of a reciprocal compensation or access charge regime would substitute for ordinary switched access lines. To do so, as an approximation, we assume that the customers migrating to VoIP from an ILEC switched access line (*i.e.*, that did not migrate from special access, wireless or CLEC access lines) would give up their ILEC switched access line when they migrate to VoIP.[21]

44. To see this, consider the following simplified example. Suppose an ILEC has 1000 access lines in its territory and observes 100 VoIP lines today under reciprocal compensation. If access charges were adopted, the QSI Model assumes that the number of VoIP lines would fall (say) to 80. If VoIP and ordinary access lines were perfectly substitutable, the number of ordinary ILEC access lines would increase to 1020. The QSI Model calculates the difference in access revenue between the regimes as 80AC – 100RC, but it ignores the 20 additional ILEC access lines. Since QSI assumes that the number of VoIP lines would decrease, it should also account for the increase in ordinary access lines. The correct change in ILEC switched access revenue under QSI's assumptions would be 80AC – 100RC + [20 × 2AC], to account for the originating and terminating traffic on the 20 additional access lines.

45. To implement this correction to the model, we calculated the difference in VoIP lines under the two regimes and used that number as the total stimulated VoIP lines assumed by QSI. That difference was then separated into (i) lines migrating to or from special access, wireless or CLEC facilities and (ii) "other" lines (presumably lines migrating to or from ordinary ILEC switched access lines). Under access charges, for example, the ILEC would receive originating and terminating interstate ***and intrastate*** switched access charges on these "other" lines. Adding this

[20] According to Merrill Lynch, the majority of Vonage subscribers use number portability, implying replacement of their telco lines or, at least, a shifting of usage to the VoIP line. See "Everything Over IP," Merrill Lynch Report, March 12, 2004 ("Merrill Lynch Report").

[21] In the QSI Model, the principal function of lines is to generate usage. Even if some new VoIP customers retain a switched access line, they would have every incentive to move access traffic onto their VoIP line.

change to the corrections discussed above increases the net ILEC access revenue difference by $214 million in 2008.

46. Of course, the effect of additional VoIP lines under reciprocal compensation implies there would be fewer ILEC switched access lines and an associated reduction in ILEC retail revenues. However, since ILECs compete with numerous wireline, cable and wireless providers in local exchange markets, QSI's suggestion that reductions in ILEC retail services — assumed by QSI to arise from a change in the intercarrier compensation regime for VoIP to PSTN traffic — should be taken into account in appraising the effects of a proposed policy change in intercarrier compensation is inappropriate. Nonetheless, the QSI Model attempts to calculate the effect of reciprocal compensation on ILEC retail revenues: it offsets ILEC access revenue losses by assumed gains in ILEC retail DSL revenue. However, it ignores any other retail revenue effect. To get a more complete picture of the effect the QSI Model predicts, its estimate should be corrected.

47. To obtain a more realistic estimate, we assumed an additional ILEC switched access line would generate $6 per month in access charges from the federal SLC. In addition, though not access revenue, we assumed the ILEC would receive its average revenue per line, net of access charges, consisting of local exchange revenues, vertical services and toll. To be conservative, we used a value of retail revenue associated with an access line of $25 per line per month.[22] Accounting for the $6 SLC per month on these lines would increase the reduction in ILEC net access revenue by an additional $180 million. Adding $25 per line for end user revenues would add approximately $748 million to that loss in 2008.

48. A second effect of the QSI Model's treatment of lines that migrate from special access, CLECs or wireless is the additional revenue ($30 per line per month) that QSI assumes is associated with the additional demand for ILEC DSL service. QSI assumes that all of these customers would migrate to ILEC DSL service. But customers who migrate to VoIP from special access would presumably send their VoIP traffic over their special access line rather than

[22] We assumed a SLC of $6.00 to be conservative. Analysts estimate ILEC average revenue per subscriber between $40 and $50 per month. (See, *e.g.*, Merrill Lynch Report, Table 7). Allowing for access charges and for the higher revenue from business subscribers, we have taken $25 per month as a conservative estimate of the monthly revenue per subscriber that an ILEC would lose (in addition to carrier access revenue) if customers disconnect their switched access lines when they move to VoIP service.

shifting to DSL. Similarly, a customer migrating from CLEC voice service would likely use a CLEC-provided DSL service rather than buying DSL from the ILEC. Only customers migrating from wireless could be expected to adopt, in some proportion, ILEC DSL. To correct this error, we apply QSI's assumed parameters – ILEC DSL increases at the same rate as total VoIP lines, and 15 percent of the additional DSL lines are assumed to generate an additional $30 per month – to the lines that migrated from wireless. The effect of this correction is to increase net access revenue by approximately $59 million.

49. Correcting the QSI Model and permitting substitution between incremental VoIP access lines and ILEC switched access lines has a substantial effect on QSI's results. Counting only the difference in the usage-related switched access charge revenue from this correction, the net revenue reduction from the change between access charges and reciprocal compensation is $1,195 million in 2008. If we include the $6 per month interstate SLC on the incremental switched access lines, the net revenue reduction increases by another $180 million. If we include a conservative $25 per month per line in local exchange and vertical services revenues, the net revenue reduction on non-rural ILECs would increase by another $748 million in 2008. Correcting the QSI-assumed DSL offset revenue increases ILEC net revenue by $59 million.

50. Combining these effects, correcting the QSI treatment of access lines assumed to be stimulated by adoption of a reciprocal compensation regime for VoIP to PSTN traffic, we obtain an ILEC net revenue effect (including switched access, SLCs and retail revenues) of approximately $2,063 million in 2008, or nearly ten times the $214 million calculated by the QSI Model. See Figure 4.

VII. Conclusion

51. The QSI Model calculates the net ILEC revenue difference between a reciprocal compensation regime and an interstate switched access regime for VoIP traffic that uses the PSTN to be approximately $214 million in 2008. Correcting errors in those calculations increases that net revenue effect shown by the QSI Model by a factor of nearly 5, from $214 million to approximately $980 million per year in 2008. If we use QSI's assumptions regarding access line stimulation and account for the effect on retail revenues, the reduction in ILEC net revenue increases by an order of magnitude from $214 million to approximately $2,063 million in 2008. While none of these numbers is small in absolute terms, certainly an annual ILEC

revenue reduction of $980 million or $2,063 million would induce significant changes in the way the costs of circuit-switched ordinary telephone service are recovered. In addition, we find that reasonable variation in the parameters of the QSI Model leads to large variation in the net ILEC revenue change.

52. From this exercise, we conclude that the QSI Model, even corrected for errors, is not likely to produce estimates of ILEC revenue effects that would be useful for policy purposes. Moreover, all we have done in this study is to make corrections and examine sensitivities within the structure and context of the QSI Model itself. That model omits a number of factors that should be included in any measure of the effect of adopting the Level 3 Petition, including

- the effect of arbitrage and fraud under a reciprocal compensation regime,
- the effect of the adoption of reciprocal compensation on rural ILECs, for which a large portion of long distance traffic is terminated indirectly through *non-rural* ILECs,
- the effect on Universal Service of removing substantial access charge revenue, and
- the effect on competition in telecommunications markets from giving an artificial regulatory advantage to VoIP providers over providers of other services such as circuit-switched or wireless long distance calls that use the PSTN in the same way.

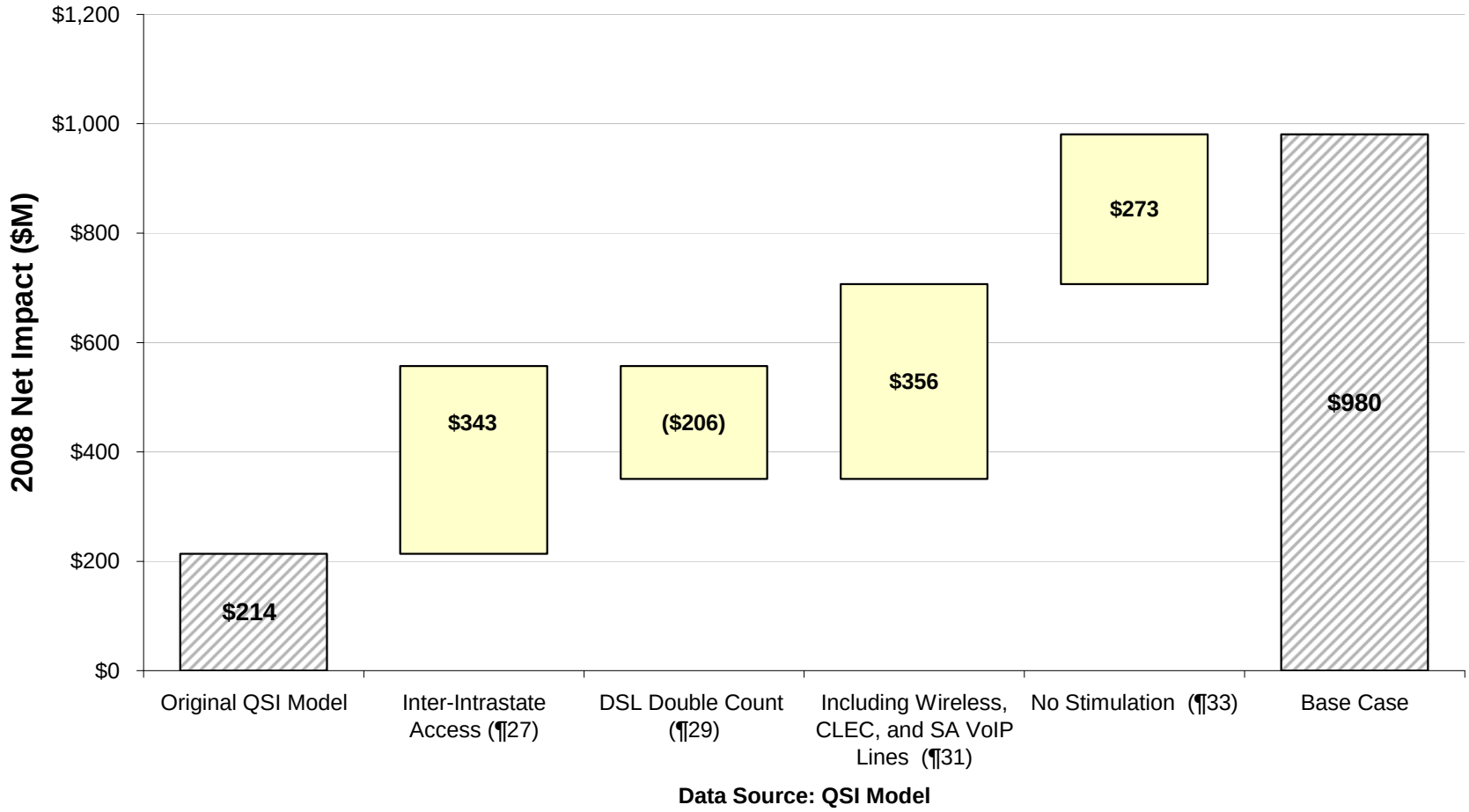
We have not attempted to quantify these effects here, and any useful attempt to measure the effect on ILEC access revenues of adopting the Level 3 Petition would need to consider these omissions from the QSI Model.

TABLES AND FIGURES

Table 1

Revenue Effects of Reciprocal Compensation v. Access Charges	
Cable-Based VoIP	$118,176,890
DSL-Based VoIP	$193,600,876
Total Effect	$311,777,766
Total Access Revenue	$4,693,204,353
Percentage Effect	6.64%
DSL Offset	$98,181,572
Total Effect (including offset)	$213,596,195
Total Access and Incremental DSL Revenue	$5,085,930,639
Percentage Effect	4.20%

Figure 1
Net Reduction in ILEC Switched Access Revenues
Reciprocal Compensation Compared with Access Charge Regime



Data Source: QSI Model

Figure 2
Net Impact to Non-Rural ILEC Switched Access Revenues

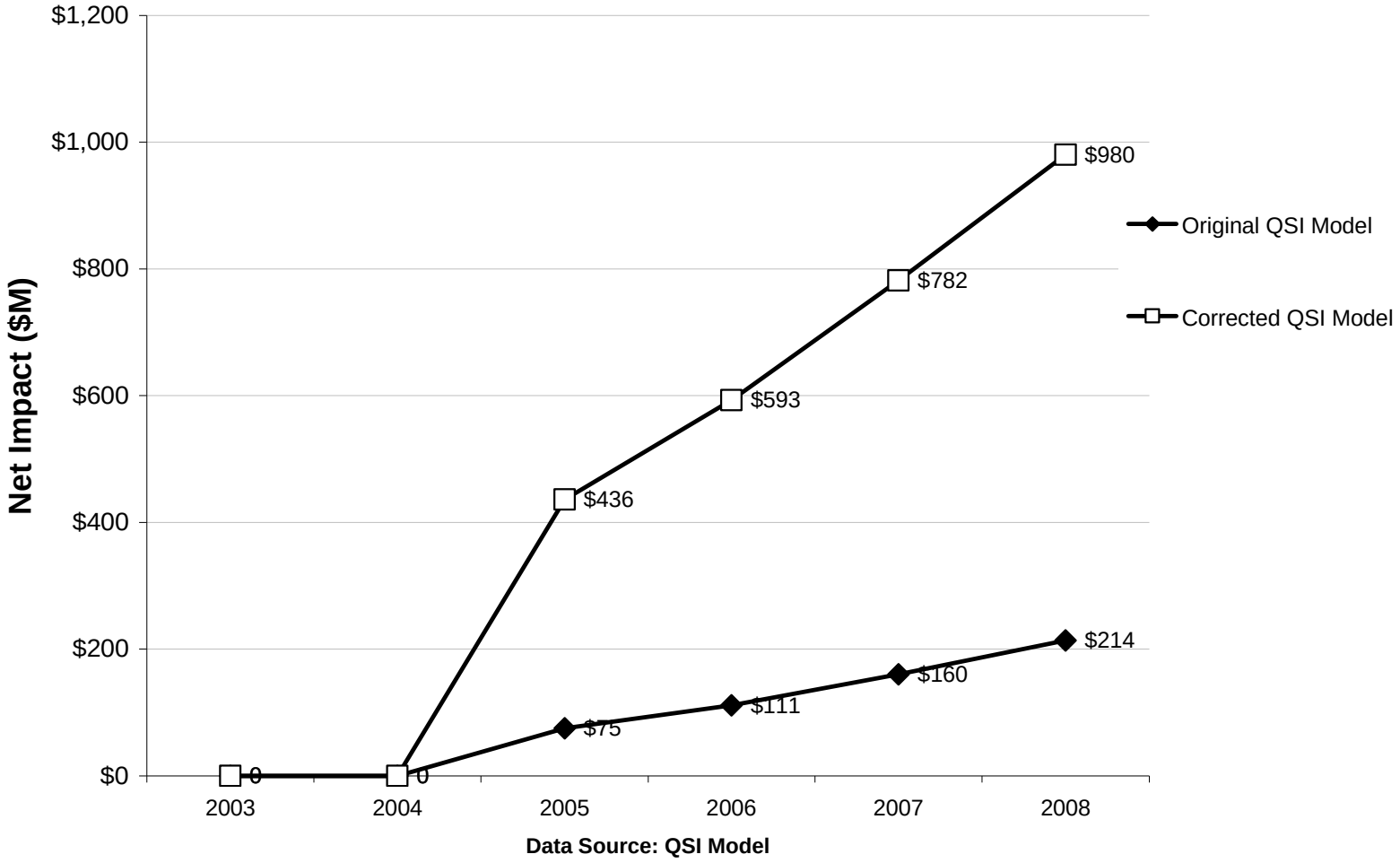


Figure 3
Sensitivity Analysis:
Net Impact of Reciprocal Compensation Regime on ILEC Access Revenues

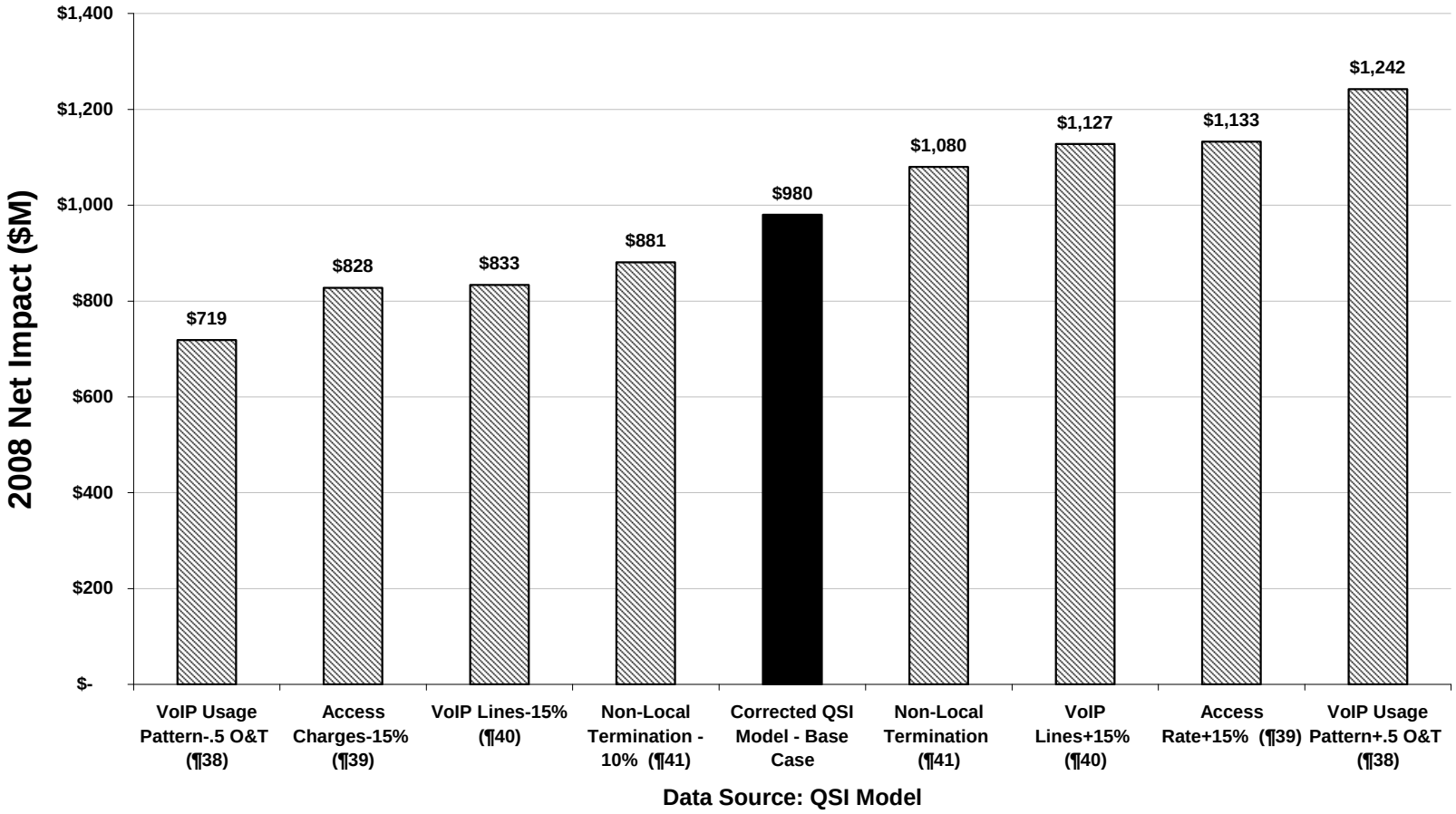
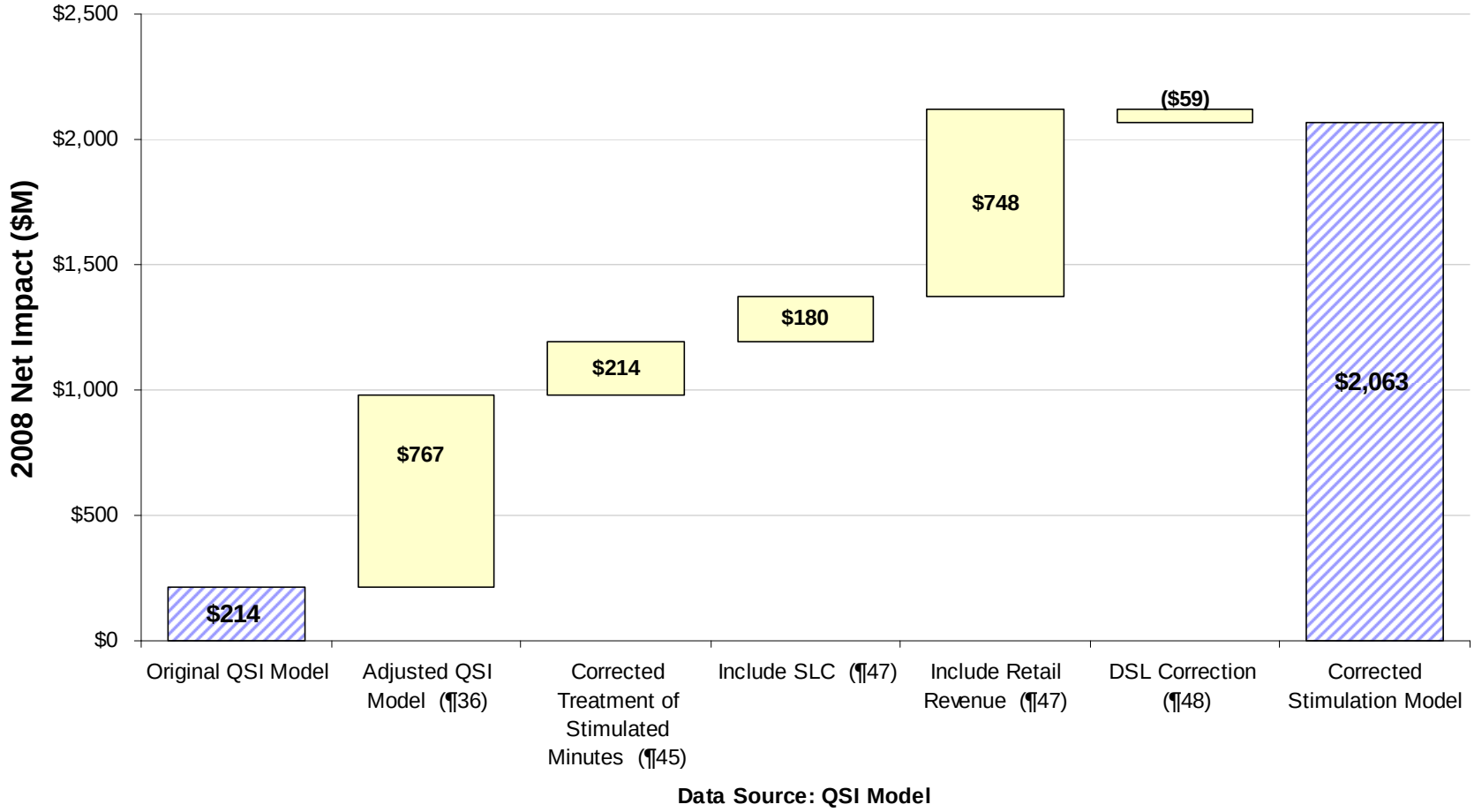


Figure 4
Net Reduction in 2008 ILEC Access and Retail Revenues:
Reciprocal Compensation Compared with Access Charge Regime



Data Source: QSI Model

ATTACHMENT I – Original QSI Model

	2003	2004	2005	2006	2007	2008
Line Assumptions						
Industry VoIP Lines (Recip Comp)	3,800,000	6,500,000	9,900,000	14,000,000	19,200,000	25,020,000
Stimulation Factor	1.00	1.00	0.80	0.80	0.80	0.80
Industry VoIP Lines (Access Rate)	3,800,000	6,500,000	7,920,000	11,200,000	15,360,000	20,016,000
VoIP lines from Wireless	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
VoIP lines from Special Access	38.6%	36.6%	34.6%	32.6%	30.6%	29.5%
VoIP lines from CLEC	13.6%	14.9%	14.9%	14.9%	14.9%	14.9%
VoIP lines in RBOC (Recip Comp)	1,851,741	3,231,205	5,089,873	7,436,080	10,524,836	13,944,528
VoIP lines in RBOC (Access Rate)	1,851,741	3,231,205	4,071,898	5,948,864	8,419,869	11,155,622
% of VoIP lines in RBOC and Non-Rural Lec Territory	89.4%	89.4%	89.4%	89.4%	89.4%	89.4%
VoIP lines in RBOC and Non-Rural Lec Territory (Recip Comp)	1,655,521	2,888,811	4,550,524	6,648,116	9,409,572	12,466,896
VoIP lines in RBOC and Non-Rural Lec Territory (Access Rate)	1,655,521	2,888,811	3,640,419	5,318,492	7,527,658	9,973,517
High Speed Internet Access Market Share for Cable	62.7%	59.4%	56.0%	55.5%	55.9%	56.3%
VoIP lines in RBOC and Non-Rural Lec Territory **DSL BASED** (Recip Comp)	617,509	1,172,857	2,002,231	2,958,411	4,149,621	5,448,034
VoIP lines in RBOC and Non-Rural Lec Territory **CABLE BASED** (Recip Comp)	1,038,012	1,715,954	2,548,294	3,689,704	5,259,951	7,018,863
VoIP lines in RBOC and Non-Rural Lec Territory **DSL BASED** (Access Rate)	617,509	1,172,857	1,601,785	2,366,729	3,319,697	4,358,427
VoIP lines in RBOC and Non-Rural Lec Territory **CABLE BASED** (Access Rate)	1,038,012	1,715,954	2,038,635	2,951,763	4,207,961	5,615,090

Original QSI Model

	2003	2004	2005	2006	2007	2008
Minute Assumptions						
Originating MOUs per Line	1,525	1,525	1,525	1,525	1,525	1,525
Terminating MOUs per Line	2,892	2,892	2,892	2,892	2,892	2,892
VoIP Origination Usage Pattern bump	2.00	2.00	2.00	2.00	2.00	2.00
VoIP Termination Usage Pattern bump	1.50	1.50	1.50	1.50	1.50	1.50
VoIP pricing stimulation under Recip Comp	1.10	1.10	1.10	1.10	1.10	1.10
VoIP pricing stimulation under Access Rate	1.10	1.10	1.05	1.05	1.05	1.05
Probability "Locally Dialed" Call to VoIP is Terminated "Non-locally"	0.20	0.20	0.20	0.20	0.20	0.20
Adj. of Terminating Volumes: VoIP customer does not receive as many calls as pre-VoIP	0.80	0.80	0.80	0.80	0.80	0.80
Minutes Calculation						
	TOTAL MOUs that originate on VoIP and Terminate on the PSTN	5,047,690,411	8,807,996,651	13,874,567,931	20,270,132,521	28,689,824,813	38,011,619,838
	TOTAL MOUs that originate on the PSTN and Terminate on VoIP	7,182,316,967	12,532,825,638	19,742,008,039	28,842,204,035	40,822,514,611	54,086,419,710
Recip Comp Regime	MOUs that originate on VoIP and Terminate on the PSTN (**DSL BASED** VOIP)	1,882,788,523	3,576,046,640	6,104,809,890	9,020,208,972	12,652,212,742	16,611,077,869
	MOUs that originate on the PSTN and Terminate on VoIP (**DSL BASED** VOIP)	2,679,004,229	5,088,327,209	8,686,483,537	12,834,780,796	18,002,728,944	23,635,765,413
	MOUs that originate on VoIP and Terminate on the PSTN (**CABLE BASED** VOIP)	3,164,901,887	5,231,950,011	7,769,758,042	11,249,923,549	16,037,612,070	21,400,541,969
	MOUs that originate on the PSTN and Terminate on VoIP (**CABLE BASED** VOIP)	4,503,312,738	7,444,498,429	11,055,524,502	16,007,423,240	22,819,785,668	30,450,654,297

Original QSI Model		***2003***	***2004***	***2005***	***2006***	***2007***	***2008***
Recip Comp Regime	Originating Volumes associated with **DSL VOIP** lines x Price Stimulation Factor	1,882,788,523	3,933,651,304	6,715,290,879	9,922,229,869	13,917,434,017	18,272,185,656
	Terminating Volumes associated with **DSL VOIP** x Probability "Locally Dialed" Call to VoIP is Terminated "Non-locally" x Adj. of Terminating Volumes	428,640,677	814,132,353	1,389,837,366	2,053,564,927	2,880,436,631	3,781,722,466
	Originating Volumes associated with **CABLE VOIP** Lines x Price Stimulation Factor	3,164,901,	5,755,145,012	8,546,733,846	12,374,915,904	17,641,373,277	23,540,596,166
	Terminating Volumes associated with **CABLE VOIP** x Probability "Locally Dialed" Call to VoIP is Terminated "Non-locally" x Adj. of Terminating Volumes	720,530,038	1,191,119,749	1,768,883,920	2,561,187,718	3,651,165,707	4,872,104,687
Access Rate Regime	**TOTAL** MOUs that originate on VoIP and Terminate on the PSTN	5,047,690,411	8,807,996,651	11,099,654,345	16,216,106,016	22,951,859,850	30,409,295,870
	TOTAL MOUs that originate on the PSTN and Terminate on VoIP	7,182,316,967	12,532,825,638	15,793,606,432	23,073,763,228	32,658,011,689	43,269,135,768
	MOUs that originate on VoIP and Terminate on the PSTN (**DSL BASED VOIP**)	1,882,788,523	3,576,046,640	4,883,847,912	7,216,167,177	10,121,770,194	13,288,862,295
	MOUs that originate on the PSTN and Terminate on VoIP (**DSL BASED** VOIP)	2,679,004,229	5,088,327,209	6,949,186,830	10,267,824,637	14,402,183,155	18,908,612,331
	MOUs that originate on VoIP and Terminate on the PSTN (**CABLE BASED** VOIP)	3,164,901,887	5,231,950,011	6,215,806,433	8,999,938,839	12,830,089,656	17,120,433,575
	MOUs that originate on the PSTN and Terminate on VoIP (**CABLE BASED** VOIP)	4,503,312,738	7,444,498,429	8,844,419,602	12,805,938,592	18,255,828,534	24,360,523,437
	Originating Volumes associated with **DSL BASED** VOIP lines x Price Stimulation Factor			5,128,040,307	7,576,975,536	10,627,858,704	13,953,305,410
	Terminating Volumes associated with **DSL VOIP** x Probability "Locally Dialed" Call to VoIP is Terminated "Non-locally" x Adj. of Terminating Volumes			1,111,869,893	1,642,851,942	2,304,349,305	3,025,377,973
	Originating Volumes associated with **CABLE VOIP** Lines x Price Stimulation Factor			6,526,596,755	9,449,935,781	13,471,594,139	17,976,455,254
	Terminating Volumes associated with **CABLE VOIP** x Probability "Locally Dialed" Call to VoIP is Terminated "Non-locally" x Adj. of Terminating Volumes			1,415,107,136	2,048,950,175	2,920,932,565	3,897,683,750

Original QSI Model

		2003	2004	2005	2006	2007	2008
Rate Assumptions							
	Recip Comp Rate	$0.0007	$0.0007	$0.0007	$ 0.0007	$ 0.0007	$ 0.0007
	Access Rate	$0.0060	$ 0.0060	$0.0060	$ 0.0060	$ 0.0060	$0.0060
	Subscriber Line Charge	$6.00	$ 6.00	$6.00	$ 6.00	$ 6.00	$6.00
	Local & Veritcal Services ARPU	$ 25.00	$25.00	$25.00	$ 25.00	$25.00	$25.00
Revenue Calculations							
	Legacy Switched Access Revenue	$7,435,535,436	$6,887,464,933	$6,138,227,995	$5,473,210,601	$4,882,725,030	$4,358,215,318
Recip Comp Regime	Terminating Volumes associated with Cable VoIP x Probability "Locally Dialed" Call to VoIP is Terminated "Non-locally" x Adj. of Terminating Volumes	($504,371)	($833,784)	($1,238,219)	($1,792,831)	($2,555,816)	($3,410,473)
	Terminating Volumes associated with DSL VoIP x Probability "Locally Dialed" Call to VoIP is Terminated "Non-locally" x Adj. of Terminating Volumes	($300,048)	($569,893)	($972,886)	($1,437,495)	($2,016,306)	($2,647,206)
	Originating Volumes associated with VoIP Cable Lines x Price Stimulation Factor	$2,215,431	$4,028,602	$5,982,714	$8,662,441	$12,348,961	$16,478,417
	Originating Volumes associated with DSL based VoIP lines x Price Stimulation Factor	$1,317,952	$2,753,556	$4,700,704	$6,945,561	$9,742,204	$12,790,530
	Total ILEC Intercarrier Comp. Revenue on VoIP Minutes	**$2,728,964**	**$5,378,481**	**$8,472,312**	**$12,377,675**	**$17,519,043**	**$23,211,268**
Access Rate Regime	Terminating Volumes associated with Cable VoIP x Probability "Locally Dialed" Call to VoIP is Terminated "Non-locally" x Adj. of Terminating Volume			$8,490,643	$12,293,701	$17,525,595	$23,386,102
	Terminating Volumes associated with DSL VoIP x Probability "Locally Dialed" Call to VoIP is Terminated "Non-locally" x Adj. of Terminating Volume			$13,342,439	$19,714,223	$27,652,192	$36,304,536
	Originating Volumes associated with VoIP Cable Lines x Price Stimulation Factor			$39,159,581	$56,699,615	$80,829,565	$107,858,732
	Originating Volumes associated with DSL based VoIP lines x Price Stimulation Factor			$61,536,484	$90,923,706	$127,534,304	$167,439,665
	Total ILEC Intercarrier Comp. Rev on VoIP Min			**$122,529,146**	**$179,631,245**	**$253,541,656**	**$334,989,035**

Original QSI Model	***2003***	***2004***	***2005***	***2006***	***2007***	***2008***
Total ILEC Revenue under Reciprocal Compensation Regime	$7,438,617,738	$6,892,843,414	$6,146,700,308	$5,485,588,276	$4,900,244,074	$4,381,426,586
Total ILEC Revenue under Interstate Access Charge Regime			$6,260,757,141	$5,652,841,846	$5,136,266,687	$4,693,204,353
Total ILEC Revenue + Incremental DSL Revenues under Recip. Comp. Regime	$7,502,256,785	$7,011,330,394	$6,342,277,908	$5,765,305,551	$5,280,408,136	$4,872,334,444
Total ILEC Revenue + Incremental DSL Revenues under Interstate Access Charge Regime			$6,417,219,221	$5,876,615,666	$5,440,397,936	$5,085,930,639
Incremental DSL Contribution						
ILEC Share of DSL Lines	93%	93%	93%	93%	93%	93%
DSL Lines serving VoIP (Recip Comp)	1,178,501	2,194,203	3,621,807	5,179,950	7,040,075	9,090,886
DSL Lines serving VoIP (Access Rate)	1,178,501	2,194,203	2,897,446	4,143,960	5,632,060	7,272,709
Assumed % of DSL-based VoIP Lines Where DSL is Ordered Because of VoIP service	15%	15%	15%	15%	15%	15%
DSL ARPU	$30	$30	$30	$30	$30	$30
Incremental DSL Revenue due to VoIP (Recip Comp)	$63,639,047	$118,486,980	$195,577,600	$279,717,275	$380,164,062	$490,907,858
Incremental DSL Revenue due to VoIP (Access Rate)	$63,639,047	$118,486,980	$156,462,080	$223,773,820	$304,131,250	$392,726,286
Total Revenue Difference						
Impact of Change on Total ILEC Revenue			**$114,056,833**	**$167,253,570**	**$236,022,613**	**$311,777,766**
Percentage to Total ILEC Revenue			1.9%	3.0%	4.8%	7.1%
Impact of Change on Total ILEC Revenue With Incremental DSL Revenue			**$74,941,313**	**$111,310,115**	**$159,989,800**	**$213,596,195**
Percentage to Total Revenue + Incremental DSL Revenue			1.2%	1.9%	3.0%	4.4%

ATTACHMENT II – QSI Stimulation Model

Line Assumptions	***2003***	***2004***	***2005***	***2006***	***2007***	***2008***
Industry VoIP Lines (Recip Comp)	3,800,000	6,500,000	9,900,000	14,000,000	19,200,000	25,020,000
Stimulation Factor	1.00	1.00	0.80	0.80	0.80	0.80
Industry VoIP Lines (Access Rate)	3,800,000	6,500,000	7,920,000	11,200,000	15,360,000	20,016,000
Stimulated Lines	-	-	1,980,000	2,800,000	3,840,000	5,004,000
% of VoIP lines in RBOC and Non-Rural Lec Territory	89.4%	89.4%	89.4%	89.4%	89.4%	89.4%
VoIP lines from Wireless	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
VoIP lines from Special Access	38.6%	36.6%	34.6%	32.6%	30.6%	29.5%
VoIP lines from CLEC	13.6%	14.9%	14.9%	14.9%	14.9%	14.9%
New VoIP Lines	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Total VoIP Lines from Wireless, Special Access, CLEC	*48.7%*	*49.7%*	*51.4%*	*53.1%*	*54.8%*	*55.7%*
VoIP lines in RBOC and Non-Rural Lec Territory (Recip Comp)	3,397,333	5,811,228	8,850,947	12,516,490	17,165,472	22,368,756
VoIP lines in RBOC and Non-Rural Lec Territory (Access Rate)	3,397,333	5,811,228	7,080,757	10,013,192	13,732,378	17,895,005
Stimulated Lines	-	-	1,770,189	2,503,298	3,433,094	4,473,751
ILEC Retail Lines substituted by VoIP under stimulation	-	-	910,105	1,329,623	1,881,914	2,493,379
Other Lines substituted by VoIP under stimulation	-	-	860,084	1,173,675	1,551,180	1,980,372

QSI Stimulation Model

Minute Assumptions

	2003	2004	2005	2006	2007	2008
Originating MOUs per Line	1,525	1,525	1,525	1,525	1,525	1,525
Terminating MOUs per Line	2,892	2,892	2,892	2,892	2,892	2,892
VoIP Origination Usage Pattern bump	2.00	2.00	2.00	2.00	2.00	2.00
VoIP Termination Usage Pattern bump	1.50	1.50	1.50	1.50	1.50	1.50
VoIP pricing stimulation under Recip Comp	1.10	1.10	1.10	1.10	1.10	1.10
VoIP pricing stimulation under Access Rate	1.10	1.10	1.05	1.05	1.05	1.05
Probability "Locally Dialed" Call to VoIP is Terminated "Non-locally"	0.20	0.20	0.20	0.20	0.20	0.20
Adj. of Terminating Volumes: VoIP customer does not receive as many calls as pre-VoIP	0.80	0.80	0.80	0.80	0.80	0.80

Minutes Calculation

Recip Comp Regime	MOUs that originate on VoIP and Terminate on the PSTN	10,358,483,049	19,490,303,632	29,685,231,685	41,979,115,514	57,571,358,420	75,022,676,440
	MOUs that originate on the PSTN and Terminate on VoIP	14,738,999,920	25,211,447,231	38,398,973,476	54,301,578,652	74,470,736,437	97,044,678,419
	Local MOUs that originate on the PSTN and terminate non-locally on VoIP	2,358,239,987	4,033,831,557	6,143,835,756	8,688,252,584	11,915,317,830	15,527,148,547
Access Rate Regime	MOUs that originate on VoIP and Terminate on the PSTN	10,358,483,049	19,490,303,632	23,748,185,348	32,056,779,120	43,963,582,793	57,290,043,827
	MOUs that originate on the PSTN and Terminate on VoIP	14,738,999,920	25,211,447,231	30,719,178,780	43,441,262,922	59,576,589,150	77,635,742,735
	Local MOUs that originate on the PSTN and terminate non-locally on VoIP	2,358,239,987	4,033,831,557	4,915,068,605	6,950,602,067	9,532,254,264	12,421,718,838

		2003	2004	2005	2006	2007	2008
Access Rate Regime	MOUs that originate on ILEC Stimulated Lines and Terminate on the PSTN	-	-	2,774,913,586	4,054,026,504	5,737,964,963	7,602,323,968
	MOUs that originate on the PSTN and Terminate on ILEC Stimulated Lines	-	-	3,948,401,608	5,768,440,807	8,164,502,922	10,817,283,942
	MOUs that originate on other Stimulated Lines and Terminate on the PSTN	-	-	2,622,401,266	3,578,539,953	4,729,554,750	6,038,162,658
	MOUs that originate on the PSTN and Terminate on other Stimulated Lines	-	-	3,731,393,087	5,091,874,923	6,729,644,365	8,591,651,742

Rate Assumptions

Recip Comp Rate	$0.0007	$0.0007	$0.0007	$0.0007	$0.0007	$0.0007
Access Rate	$0.0141	$0.0141	$0.0136	$0.0131	$0.0126	$0.0121
Blended Access Rate	$0.0141	$0.0141	$0.0136	$0.0131	$0.0126	$0.0121
Subscriber Line Charge	$6.0	$6.0	$6.0	$6.0	$6.0	$6.0
Local & Veritcal Services ARPU	$25.0	$25.0	$25.0	$25.0	$25.0	$25.0

Recip Comp Regime	Rate for MOUs that originate on VoIP and Terminate on the PSTN	$0.0007	$0.0007	$0.0007	$0.0007	$0.0007	$0.0007
	Rate for MOUs that originate on the PSTN and Terminate on VoIP	--	--	--	--	--	--
	Rate for Local MOUs that originate on the PSTN and terminate non-locally on VoIP	-$0.0007	-$0.0007	-$0.0007	-$0.0007	-$0.0007	-$0.0007
Access Rate Regime	Rate for MOUs that originate on VoIP and Terminate on the PSTN	$0.0141	$0.0141	$0.0136	$0.0131	$0.0126	$0.0121
	Rate for MOUs that originate on the PSTN and Terminate on VoIP	--	--	--	--	--	--
	Rate for Local MOUs that originate on the PSTN and terminate non-locally on VoIP	$0.0141	$0.0141	$0.0136	$0.0131	$0.0126	$0.0121

		2003	2004	2005	2006	2007	2008
Access Rate Regime	Rate for MOUs that originate on ILEC Stimulated Lines and Terminate on the PSTN	$0.0283	$0.0283	$0.0272	$0.0262	$0.0252	$0.0243
	Rate for MOUs that originate on the PSTN and Terminate on ILEC Stimulated Lines	$0.0141	$0.0141	$0.0136	$0.0131	$0.0126	$0.0121
	Rate for MOUs that originate on other Stimulated Lines and Terminate on the PSTN	$0.0141	$0.0141	$0.0136	$0.0131	$0.0126	$0.0121
	Rate for MOUs that originate on the PSTN and Terminate on other Stimulated Lines	--	--	--	--	--	--

Revenue Calculations

Legacy Switched Access Revenue	$7,435,535,436	$6,887,464,933	$6,138,227,995	$5,473,210,601	$4,882,725,030	$4,358,215,318
Recip Comp Regime Revenue	$5,600,170	$10,819,530	$16,478,977	$23,303,604	$31,959,228	$41,646,870
Access Rate Regime Switched Access Revenue	-	-	$554,666,909	$739,188,352	$981,783,000	$1,236,504,162
Access Rate Regime Switched SLC Revenue			$65,527,550	$95,732,864	$135,497,836	$179,523,307
Access Rate Regime Local and Veritcal Services Revenue	-	-	$273,031,458	$398,886,932	$564,574,315	$748,013,778
Access Related Access Rate Regime Revenue	-	-	$620,194,459	$834,921,215	$1,117,280,836	$1,416,027,469
Total Access Rate Regime Revenue	-	-	$893,225,917	$1,233,808,147	$1,681,855,152	$2,164,041,247

Incremental DSL Contribution

% non wireless, non-CLEC and non-Business VoIP lines on DSL	37%	41%	44%	45%	44%	44%
ILEC Share of DSL Lines	93%	93%	93%	93%	93%	93%
ILEC DSL Lines serving VoIP (Recip Comp)	625,182	1,184,121	2,016,182	2,971,729	4,158,703	5,453,489
ILEC DSL Lines serving VoIP (Access Rate)	625,182	1,184,121	1,612,946	2,377,384	3,326,962	4,362,791

	2003	2004	2005	2006	2007	2008
Assumed % of DSL-based VoIP Lines Where DSL is Ordered Because of VoIP service	15%	15%	15%	15%	15%	15%
Incremental DSL Orders due to VoIP (Recip Comp)	93,777	177,618	302,427	445,759	623,805	818,023
Incremental DSL Orders due to VoIP (Access Rate)	93,777	177,618	241,942	356,608	499,044	654,419
DSL ARPU (Monthly)	$30.00	$30.00	$30.00	$30.00	$30.00	$30.00
Incremental DSL Revenue due to VoIP (Recip Comp)	$33,759,835	$63,942,510	$108,873,852	$160,473,391	$224,569,958	$294,488,381
Incremental DSL Revenue due to VoIP (Access Rate)	$33,759,835	$63,942,510	$87,099,082	$128,378,713	$179,655,967	$235,590,705

Total Revenue Difference

Net Impact (only access)	$0	$0	$538,187,932	$715,884,748	$949,823,772	$1,194,857,292
% of Total			*8.7%*	*13.0%*	*19.3%*	*27.2%*
Net Impact (access, DSL)	$0	$0	$516,413,162	$683,790,070	$904,909,780	$1,135,959,616
Net Impact (access and SLC)	$0	$0	$603,715,482	$811,617,611	$1,085,321,608	$1,374,380,599
% of Total			*9.8%*	*14.8%*	*22.1%*	*31.2%*
Net Impact (access, SLC, and DSL)	$0	$0	$581,940,712	$779,522,933	$1,040,407,616	$1,315,482,923
% of Total			*9.3%*	*13.8%*	*20.2%*	*28.0%*
Net Impact (access, SLC and services)	$0	$0	$876,746,940	$1,210,504,543	$1,649,895,923	$2,122,394,377
Net Impact (access, DSL, SLC, and services)	$0	$0	$854,972,169	$1,178,409,865	$1,604,981,931	$2,063,496,701

Summary

Intercarrier Usage	$538,187,932	$715,884,748	$949,823,772	$1,194,857,292
SLC	$65,527,550	$95,732,864	$135,497,836	$179,523,307
Local and Vertical Services	$273,031,458	$398,886,932	$564,574,315	$748,013,778
DSL Offset	$ (21,774,770)	$ (32,094,678)	$ (44,913,992)	$ (58,897,676)
Total	$854,972,169	$1,178,409,865	$1,604,981,931	$$2,063,496,701